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which, by virtue of the relation $A+B+C=\pi$, reduces to

$$\frac{R^2}{2}\{\sin 2A + \sin 2B - \sin 2(A+B)\}.$$

$$\therefore \text{ Average area} = \frac{R^2}{2} \frac{\int_{0}^{\pi} \int_{0}^{\pi-A} \sin 2A + \sin 2B - \sin 2(A+B) \} dA dB}{\int_{0}^{\pi} \int_{0}^{\pi-A} dA dB} = \frac{3R^2}{2\pi}.$$

31. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics in Drury College, Spring-field, Missouri.

Find the average length of a line drawn across the opposite sides of a rectangle, length l and breadth b.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science, Texarkana College, Texarkana, Arkansas-Texas; and the PROPOSER.

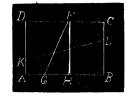
Let ABCD be the rectangle, FG the random line. Let AB=l, BC=b, AH=x, AG=y.

Then $FG = \{b^2 + (x-y)^2\}^{\frac{1}{2}}$.

The limits of x are 0 and l; of y, 0 and x.

Hence the required average area is

$$\Delta = \frac{\int_{0}^{l} \int_{0}^{x} \{b^{\frac{n}{2}} + (x - y)^{\frac{n}{2}}\}^{\frac{1}{2}} dx dy}{\int_{0}^{l} \int_{0}^{x} dx dy}$$



$$= \frac{2}{l^2} \int_0^l \int_0^x \{b^2 + (x-y)^2\}^{\frac{1}{2}} dx dy$$

$$= \frac{1}{l^2} \int_0^l \left\{ x(b^2 + x^2)^{\frac{1}{2}} + b^2 \log[x + (b^2 + x^2)^{\frac{1}{2}}] - b^2 \log b \right\} dx$$

$$=\frac{1}{3l^2}(l^2+b^2)^{\frac{3}{4}}+\frac{b^2}{l}\log\{l+(l^2+b^2)^{\frac{1}{4}}\}-\frac{b^2}{l}\log b-\frac{1}{l^2}(l^2+b^2)^{\frac{1}{4}}-\frac{b^3}{3l^2}+\frac{b}{l^2}.$$

For the line KL, we get, by writing l for b and b for l,

Cor. I. If
$$l=b$$
, $\Delta = \frac{1}{3}(2l\sqrt{2}) + l\log(1+\sqrt{2}) - \frac{1}{l}\sqrt{2} - \frac{1}{3}l + \frac{1}{l}$.

Cor. II. If l=b=1, $\Delta=\frac{1}{3}(2-\sqrt{2})+\log(1+\sqrt{2})$, which is the same result as given in Williamson's Integral Calculus, page 409.

Also solved by F. P. MATZ.